

Gas Exchange, Transpiration and Yield of Sweetpotato Grown in a Controlled Environment

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Sweetpotato was grown to harvest maturity within NASA Johnson Space Center's Variable Pressure Growth Chamber (VPGC) to characterize crop performance for potential use in advanced life support systems as a contributor to food production, air revitalization and resource recovery. Stem cuttings of breeding clone "TU-82-155" were grown hydroponically at a density of 17 plants m⁻² using a modified pressure-plate growing system (Patent No. 4860-490, Tuskegee University). Lighting was provided by HPS lamps at a photoperiod of 12h light:12h dark. The photosynthetic photon flux was maintained at 500, 750 and 1000 $\mu\text{mol m}^{-2} \text{s}^{-1}$ during days 1-15, 16-28, 29-119, respectively. Canopy temperatures were maintained at 28°C:light:22°C:dark. During the light period, relative humidity and carbon dioxide were maintained at 70% and 1200 $\mu\text{l l}^{-1}$, respectively. Nutrient solution was manually adjusted 2 to 4 times per week by addition of 10X concentrated modified half-strength Hoagland nutrient salts and NaOH to return the electrical conductivity and pH to 1.2 mS cm⁻¹ and 6.0, respectively. At 17 weeks (119 days) from transplanting, a total of 56.5 kg fresh mass of storage roots (84.1% moisture) were harvested from the 11.2 m² chamber, resulting in a yield 5.0 kg m⁻². Harvest index, based on fresh mass, was 38.6%. Rates of net photosynthesis, dark respiration, transpiration, and ethylene production will be reported.

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